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EXAMINER

WEST, JEFFREY R

ART UNIT PAPER NUMBER

2857

DATE MAILED: 12/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/808,499

Applicant(s)

MIYAIRI ET AL.

Examiner

Jeffrey R. West

Art Unit

2857

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) 83 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims pending in the application are
1,3,11,13,16,18,26,28,32,34,37,39,42,44,45,47,50,52,53,55,58,60,69,71,74,76,77,79,82 and 83.

Continuation of Disposition of Claims: Claims rejected are
1,3,11,13,16,18,26,28,32,34,37,39,42,44,45,47,50,52,53,55,58,60,69,71,74,76,77,79 and 82.

DETAILED ACTION

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

EXAMINER'S AMENDMENT

2. In the specification amendment filed May 30, 2006, Applicant has attempted to amend the paragraph beginning at page 40, line 12, as "The power supply voltage...". It is noted that this paragraph, however, begins on page 40, line 16 and therefore the application has been amended as follows:

On page 40, lines 16-17, "printed circuit 806" has been changed to ---printed substrate 806---.

Claim Objections

3. Claims 1, 3, 26, and 28 are objected to because of the following informalities:

In claim 1, line 4, to avoid problems of antecedent basis, "visible light" should be -
--visible light to produce a photographed image---.

In claim 1, line 11, to avoid problems of antecedent basis, "n basic" should be ---
m basic---.

In claim 1, line 12, to avoid problems of antecedent basis, "m rows" should be ---
n rows---.

In claim 3, line 4, to avoid problems of antecedent basis, "visible light" should be -
--visible light to produce a photographed image---.

In claim 3, line 10, to avoid problems of antecedent basis, "n basic" should be ---
m basic---.

In claim 3, line 11, to avoid problems of antecedent basis, "m rows" should be ---
n rows---.

In claim 26, line 5, to avoid problems of antecedent basis, "visible light" should be
---visible light to produce a photographed image---.

In claim 26, line 12, to avoid problems of antecedent basis, "m rows" should be --
-n rows---.

In claim 28, line 11, to avoid problems of antecedent basis, "m rows" should be --
-n rows---.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 11, 13, 16, 28, 44, 52, 60, and 76 are rejected under 35 U.S.C. 112,

second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 11 is considered to be vague and indefinite because it attempts to further limit parent claim 1 "wherein the crystallinity of the semiconductor film is tested using an average luminance of the digital image." Parent claim 1, however, already tests the crystallinity of the semiconductor film using an average value explicitly defined as "an average value of a corrected saturation". Therefore, it is unclear to one having ordinary skill in the art as to the manner in which claim 11 is to further limit parent claim 1 since claim 11 appears to contradict what is already present in parent claim 1.

Claim 13 is considered to be vague and indefinite because it attempts to further limit parent claim 3 "wherein the crystallinity of the semiconductor film is tested by further using an average luminance the digital image." Parent claim 3, however, already tests the crystallinity of the semiconductor film using an average value explicitly defined as "an average value of luminance". Therefore, it is unclear to one having ordinary skill in the art as to the manner in which claim 13 is to further limit parent claim 3 since claim 13 appears to recite what is already present in parent claim 3.

Claim 16 is considered to be vague and indefinite because it attempts to further limit parent claim 1 "wherein the crystallinity of the semiconductor film is tested by further using an average corrected saturation in the digital image." Parent claim 1, however, already tests the crystallinity of the semiconductor film using an average

value explicitly defined as “an average value of a corrected saturation”. Therefore, it is unclear to one having ordinary skill in the art as to the manner in which claim 16 is to further limit parent claim 1 since claim 16 appears to recite what is already present in parent claim 1.

Claim 28 is rejected under 35 U.S.C. 112, second paragraph, because in line 7 reference is made to “the digital image”. Claim 28, however, contains no mention of any images and therefore it is unclear to one having ordinary skill in the art as to what “the digital image” refers.

Claims 44, 52, 60, and 76 are rejected under 35 U.S.C. 112, second paragraph, because they incorporate the lack of clarity present in parent claim 28.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 3, 13, 34, 39, 71, and 79, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,975,386 to Tsumura et al. in view of U.S. Patent No. 6,647,148 to Ozawa et al. and further in view of U.S. Patent Application Publication No. 2005/0041226 to Tanaka et al.

With respect to claim 3, Tsumura discloses a method for testing comprising irradiating a visible light on a surface of a semiconductor film (column 3, lines 46-53) of which the crystallinity is improved by irradiating an energy beam (column 7, lines 12-20), photo-transferring a scattered light of the irradiated visible light to form an image (column 10, lines 41-53), and analyzing regions of the image to discriminate regions of luminance (column 10, lines 1-12).

With respect to claim 71, Tsumura discloses testing each of a plurality of semiconductor films crystallized by an energy beam (column 9, lines 48-57) having a different density (column 11, lines 53-58) and determining an irradiation energy density by a result of the testing to crystallize a semiconductor film (column 12, lines 10-18).

With respect to claim 34, Tsumura discloses that the energy beam is a laser light (column 12, lines 16-18).

With respect to claim 39, Tsumura discloses that the visible light has such light source as a halogen lamp (column 10, lines 57-62).

Tsumura also discloses a method for testing a beam profile comprising irradiating an energy beam on a substrate on which an amorphous semiconductor film (column 4, lines 62-66) is formed (column 7, lines 12-20), irradiating a visible light on a surface of the substrate (column 3, lines 46-53) and photo-transferring the scattered light to form an image (column 10, lines 41-53), and analyzing regions of the image to discriminate regions of luminance (column 10, lines 1-12) to test a profile of the

energy beam (column 9, lines 48-57, column 11, lines 53-58, and column 12, lines 10-18).

As noted above, the invention of Tsumura teaches many of the features of the claimed invention and while the invention of Tsumura does teach determining defects caused by changes in observed luminance/intensity reflectance in a surface image (column 7, line 55 to column 8, line 13 and column 10, lines 1-12), Tsumura does not include the specifics on how the image discriminator determines locations of the defects.

Ozawa teaches a boundary line detecting method to determine areas with differences in light reflectance on a device surface (column 5, lines 12-17) comprising a camera to take a photograph of reflected light (column 6, lines 5-9), digitizing the photographed image to make a digital image (column 7, lines 63-65), and calculating an average luminance of the digital image (column 8, lines 16-20) by a computer (column 5, lines 60-63), sectioning $m \times n$ basic units by dividing the digital image into m in the X direction and n in the Y direction in a predetermined analysis region (column 7, lines 25-31 and 59-63 and Figure 4A), calculating/testing an average of luminance of the n basic units altogether aligned in the X directions per each of the m rows aligned in the Y direction (column 8, lines 16-20), obtaining an approximate line from a relation of a position in the Y direction to the average value of the luminance corresponding to the position in the Y direction, and testing the device surface with a fluctuation obtained from the approximate line and the average of the luminance (column 8, lines 3-20 and Figure 4C).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura to include the specifics on how the image discriminator determines locations of the defects, as taught by Ozawa, because Ozawa suggests a corresponding method for determining borders caused by variations in brightness (column 5, lines 12-17), as applicable to the defect detection invention of Tsumura, that would have improved the accuracy of the defect detection by employing a method that is not limited by the arrangement of the photodetectors of the detection apparatus (column 2, lines 55-61).

As noted above, the invention of Tsumura and Ozawa teaches many of the features of the claimed invention and while the invention of Tsumura and Ozawa does teach calculating an average of luminance of the m basic units aligned in the X directions per each of the n rows aligned in the Y direction of a surface scanned by an energy beam, the combination does not explicitly indicate that the measurement is to be performed in a direction perpendicular to the scanning direction of the light.

Tanaka teaches a method and device for exposure control comprising scanning reticle stage in an x-direction using a light source (0129, lines 1-13), receiving reflected light (0131, lines 1-7) and measuring a distribution of luminance (0321, lines 1-8) wherein the measurement is performed in a direction perpendicular to the scanning direction of the light (0322, lines 1-5).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura and Ozawa to explicitly indicate that the measurement is to be performed in a direction perpendicular to the scanning direction of the light, as

taught by Tanaka, because, as suggested by Tanaka, the combination would have improved the measurement of Tsumura and Ozawa by canceling any irregularity of luminance measured in the scanning direction caused by the scanning itself (0322, lines 1-5).

With respect to claim 79, since the invention of Tsumura teaches performing testing by employing a plurality of components in a crystallization chamber/container (column 6, lines 53-54) and the invention of Ozawa teaches including a means for photographing the scattered light as part of the components for testing, the combination would have provided a means for photographing the scattered light in a crystallization chamber.

8. Claims 1, 11, 16, 18, 32, 37, 69, and 77, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al. and Tanaka et al. and further in view of U.S. Patent Application Publication No. 2004/0228526 to Lin et al.

As noted above, Tsumura in combination with Ozawa and Tanaka teaches many of the features of the claimed invention and while the invention of Tsumura, Ozawa, and Tanaka does teach measuring an average luminance of an image to determine variations of a surface illuminated by a multi-color light source (Tsumura; column 10, lines 57-59), the combination does not specify determining a corrected saturation value for the image.

Lin teaches a system and method for color characterization using fuzzy pixel classification with application in color matching and color match location comprising means for inspecting a surface of an object (0003, lines 7-12) by dividing an image into regions of interest (0038, lines 1-12) and measuring a saturation value for the image (0112, lines 1-15) that has been corrected/normalized to a range from 0 to 255 (0110, lines 8-11).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, and Tanaka to specify determining a corrected saturation value for the image, as taught by Lin, because the invention of Tsumura, Ozawa, and Tanaka does teach measuring an average luminance of an image to determine variations of a surface illuminated by a multi-color light source and Lin suggests a corresponding method that would have improved the inspection method of Tsumura, Ozawa, and Tanaka by determining saturation values useful in inspecting colored surfaces, such as the surface colored by the multi-color light source of Tsumura, Ozawa, and Tanaka, and provided increased accuracy in surface inspection by measuring saturation values that provide more information regarding color variations (0004, lines 1-10 and 0006, line 1 to 0007, line 8).

9. Claims 47 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al. and Tanaka and further in view of U.S. Patent Application Publication No. 2003/0142298 to Ujihara et al.

As noted above, Tsumura in combination with Ozawa and Tanaka teaches many of the features of the claimed invention and while the invention of Tsumura, Ozawa, and Tanaka does teach applying a visible light to the surface of a semiconductor film, the visible light being the light from a halogen source, the combination does not specify the output of the halogen source.

Ujihara teaches an inspection method and inspection system of a surface of an article through the inspection of a photographed image of its surface (0002, lines 1-3) in order to determine the illumination variations of the surface, wherein the surface is illuminated by a light source (0009, lines 1-13) such as a halogen lamp with an intensity of 20,000 to 100,000 lux (0052, lines 1-9).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, and Tanaka to specify a corresponding output of the halogen source, as taught by Ujihara, because the combination of Tsumura, Ozawa and Tanaka does teach implementing a halogen light source and Ujihara suggests a corresponding intensity range suitable for a halogen lamp to carry out the inspection of Tsumura, Ozawa, and Tanaka (0052, lines 1-9).

10. Claims 45 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al. Tanaka, and Lin and further in view of U.S. Patent Application Publication No. 2003/0142298 to Ujihara et al.

As noted above, Tsumura in combination with Ozawa, Tanaka, and Lin teaches many of the features of the claimed invention and while the invention of Tsumura,

Ozawa, Tanaka, and Lin does teach applying a visible light to the surface of a semiconductor film, the visible light being the light from a halogen source, the combination does not specify the output of the halogen source.

Ujihara teaches an inspection method and inspection system of a surface of an article through the inspection of a photographed image of its surface (0002, lines 1-3) in order to determine the illumination variations of the surface, wherein the surface is illuminated by a light source (0009, lines 1-13) such as a halogen lamp with an intensity of 20,000 to 100,000 lux (0052, lines 1-9).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, Tanaka, and Lin to specify a corresponding output of the halogen source, as taught by Ujihara, because the combination of Tsumura, Ozawa, Tanaka, and Lin does teach implementing a halogen light source and Ujihara suggests a corresponding intensity range suitable for a halogen lamp to carry out the inspection of Tsumura, Ozawa, Tanaka, and Lin (0052, lines 1-9).

11. Claims 28, 44, and 76, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al. and Tanaka and further in view of U.S. Patent No. 6,861,614 to Tanabe et al.

As noted above, Tsumura in combination with Ozawa and Tanaka teaches many of the features of the claimed invention and while the invention of Tsumura, Ozawa, and Tanaka does teach a method for testing a beam profile by irradiating a laser

energy beam on a substrate on which an amorphous semiconductor film is formed, the combination does not specify that the laser is applied as a pulse.

Tanabe teaches an S-System for the formation of a silicon thin film and a semiconductor-insulating film interface comprising performing laser-induced crystallization using a laser pulse (column 2, lines 1-14 and column 20, line 60 to column 21, line 10).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, and Tanaka to specify that the laser is applied as a pulse, as taught by Tanabe, because the combination, as suggested by Tanabe, would have provided a conventional method to enable one having ordinary skill in the art to carry out the crystallization improvement of Tsumura, Ozawa, and Tanaka thereby providing results in accordance with convention (column 2, lines 1-14 and column 20, line 60 to column 21, line 10).

12. Claims 26, 42, 74, and 82, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al., Tanaka, and Lin and further in view of U.S. Patent No. 6,861,614 to Tanabe et al.

As noted above, Tsumura in combination with Ozawa, Tanaka, and Lin teaches many of the features of the claimed invention and while the invention of Tsumura, Ozawa, Tanaka, and Lin does teach a method for testing a beam profile by irradiating a laser energy beam on a substrate on which an amorphous

semiconductor film is formed, the combination does not specify that the laser is applied as a pulse.

Tanabe teaches an S-System for the formation of a silicon thin film and a semiconductor-insulating film interface comprising performing laser-induced crystallization using a laser pulse (column 2, lines 1-14 and column 20, line 60 to column 21, line 10).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, Tanaka, and Lin to specify that the laser is applied as a pulse, as taught by Tanabe, because the combination, as suggested by Tanabe, would have provided a conventional method to enable one having ordinary skill in the art to carry out the crystallization improvement of Tsumura, Ozawa, Tanaka, and Lin thereby providing results in accordance with convention (column 2, lines 1-14 and column 20, line 60 to column 21, line 10).

13. Claims 52 and 60, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al., Tanaka, and Tanabe and further in view of U.S. Patent Application Publication No. 2003/0142298 to Ujihara et al.

As noted above, Tsumura in combination with Ozawa, Tanaka, and Tanabe teaches many of the features of the claimed invention and while the invention of Tsumura, Ozawa, Tanaka, and Tanabe does teach applying a visible light to the

surface of a semiconductor film, the visible light being the light from a halogen source, the combination does not specify the output of the halogen source.

Ujihara teaches an inspection method and inspection system of a surface of an article through the inspection of a photographed image of its surface (0002, lines 1-3) in order to determine the illumination variations of the surface, wherein the surface is illuminated by a light source (0009, lines 1-13) such as a halogen lamp with an intensity of 20,000 to 100,000 lux (0052, lines 1-9).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, Tanaka, and Tanabe to specify a corresponding output of the halogen source, as taught by Ujihara, because the combination of Tsumura, Ozawa, Tanaka, and Tanabe does teach implementing a halogen light source and Ujihara suggests a corresponding intensity range suitable for a halogen lamp to carry out the inspection of Tsumura, Ozawa, Tanaka, and Tanabe (0052, lines 1-9).

14. Claims 50 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. in view of Ozawa et al., Tanaka, Lin, and Tanabe and further in view of U.S. Patent Application Publication No. 2003/0142298 to Ujihara et al.

As noted above, Tsumura in combination with Ozawa, Tanaka, Lin, and Tanabe teaches many of the features of the claimed invention and while the invention of Tsumura, Ozawa, Tanaka, Lin, and Tanabe does teach applying a visible light to the

surface of a semiconductor film, the visible light being the light from a halogen source, the combination does not specify the output of the halogen source.

Ujihara teaches an inspection method and inspection system of a surface of an article through the inspection of a photographed image of its surface (0002, lines 1-3) in order to determine the illumination variations of the surface, wherein the surface is illuminated by a light source (0009, lines 1-13) such as a halogen lamp with an intensity of 20,000 to 100,000 lux (0052, lines 1-9).

It would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura, Ozawa, Tanaka, Lin, and Tanabe to specify a corresponding output of the halogen source, as taught by Ujihara, because the combination of Tsumura, Ozawa, Tanaka, Lin, and Tanabe does teach implementing a halogen light source and Ujihara suggests a corresponding intensity range suitable for a halogen lamp to carry out the inspection of Tsumura, Ozawa, Tanaka, Lin, and Tanabe (0052, lines 1-9).

Response to Arguments

15. Applicant's arguments with respect to claims 1, 3, 11, 13, 16, 18, 26, 28, 32, 34, 37, 39, 42, 44, 45, 47, 50, 52, 53, 55, 58, 60, 69, 71, 74, 76, 77, 79, and 82 have been considered but are moot in view of the new ground(s) of rejection.

The following arguments, however, are noted:

Applicant argues:

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims, as amended. The independent claims have

been amended to recite obtaining an approximate line from a relation of an position in the Y direction to the average value [or the sum] corresponding to the position in the Y direction; and testing the crystallinity of the semiconductor film, of which the crystallinity is improved, with a fluctuation obtained from the approximate line, and the average value [or the sum]. Tsumura, Ozawa, Tanaka, Ujihara, Tanabe and Lin, either alone or in combination, do not teach or suggest the above-referenced features of the present invention.

The Official Action concedes that "Tsumura does not include the specifics of how the image discriminator determines locations of the defects" (pages 11-12, Paper No. 20051129) and relies on Ozawa to allegedly cure the deficiencies in Tsumura. However, Ozawa merely discloses an X0 position having a maximum of added value derived luminance values to specify the boundary line in Figure 4. Tsumura, Ozawa, Tanaka, Ujihara, Tanabe and Lin, either alone or in combination, do not teach or suggest obtaining an approximate line from a relation of an position in the Y direction to the average value corresponding to the position in the Y direction; and testing the crystallinity of the semiconductor film, of which the crystallinity is improved, with a fluctuation obtained from the approximate line, and the average value or the sum.

With respect to claim 3, for example, Tsumura discloses a method for testing comprising irradiating a visible light on a surface of a semiconductor film (column 3, lines 46-53) of which the crystallinity is improved by irradiating an energy beam (column 7, lines 12-20), photo-transferring a scattered light of the irradiated visible light to form an image (column 10, lines 41-53), and analyzing regions of the image to discriminate regions of luminance (column 10, lines 1-12).

A film quality inspecting method according to claim 1 comprises: applying a measuring beam having a specific wavelength to an annealed silicon film formed on a substrate in a direction inclined with respect to the silicon film; measuring a reflection intensity or reflectivity of a reflection beam reflected by the silicon film as a result of the application; and inspecting a film quality of the silicon film based on a measurement value obtained by the measurement. (column 3, lines 46-53)

Thus obtained line beam is applied by the image forming lens 10 through the mirror 11a onto the glass substrate on which is formed the a-Si film, which is the processing subject 2, to thereby scan the XY scanning table 3, thus crystallizing

all the surface of the a-Si film formed on the glass substrate. In this case, laser beam output provided by the excimer laser oscillator 9 is controlled at a fluence suitable for poly-crystallization by the variable attenuator. (column 7, lines 12-20)

As is clear from the distribution in each of the regions in FIG. 7, region 2 is lower in reflection beam intensity than regions 1, 3, and 4 and so can be discriminated from these. Region 3 indicating acceptable-ness, however, has almost the same distribution range of the reflection beam intensity as that of regions 1 and 4 and so cannot be discriminated from these. Besides, generally, regions 1 and 3 scarcely coexist on the same substrate, so that it is enough if regions 1 and 2 or regions 2, 3, and 4 and can be discriminated from each other. If, therefore, regions 3 and 4 can be discriminated from each other, all of the four regions can be from each other. (column 10, lines 1-12)

In the poly-crystal film inspecting apparatus 29, a detection optical system is disposed above the XY table 31, on which is mounted the glass substrate 51 with the p-Si substrate 55, which is the processing subject, formed thereon as shown in FIG. 10 also. This detection optical system has such a configuration that as viewed from the side of the XY table 31 are sequentially disposed along the optical axis a magnification optical system 22 and a half mirror 23 and also, on the transmission side along the optical axis of the half mirror 23 is disposed a two-dimensional beam sensor 24, which photo-electrically transfers an electric signal and then outputs it to an image processing/crystallinity deciding section 25. (column 10, lines 41-53),

Ozawa teaches a boundary line detecting method to determine areas with differences in light reflectance on a device surface (column 5, lines 12-17) comprising a camera to take a photograph of reflected light (column 6, lines 5-9), digitizing the photographed image to make a digital image (column 7, lines 63-65), and calculating an average luminance of the digital image (column 8, lines 16-20) by a computer (column 5, lines 60-63), sectioning $m \times n$ basic units by dividing the digital image into m in the X direction and n in the Y direction in a predetermined analysis region (column 7, lines 25-31 and 59-63 and Figure 4A), calculating/testing

an average of luminance of the n basic units altogether aligned in the X directions per each of the m rows aligned in the Y direction (column 8, lines 16-20), obtaining an approximate line from a relation of a position in the Y direction to the average value of the luminance corresponding to the position in the Y direction, and testing the device surface with a fluctuation obtained from the approximate line and the average of the luminance (column 8, lines 3-20 and Figure 4C).

According to the boundary line detecting method of the present invention, as summarized above, a boundary line between areas difference in light reflectance can be detected with an extremely high accuracy, and the position of the boundary line can be specified at a distance shorter than the arrangement pitch of pixels. (column 5, lines 12-17)

The image obtained by the camera 13 is processed in an image processor 15, which is operated in accordance with a computer software program. (column 5, lines 60-63),

FIG. 3A shows an image taken by the camera 13 after directing parallel rays of light to the combined portion of both the tip of load beam 2 and the head body 1 from just above by means of a light radiating device and after subsequent magnifying with the magnifying lens 14. (column 6, lines 5-9)

FIG. 4A shows the luminance peak P_x portion in the image shown in FIG. 3C. In FIG. 4, a unit block G in the image represents an image block detected by one photodetector in the camera 13. For example, its width in each of X and Y directions is $4\text{ }\mu\text{m}$, as noted previously. In FIG. 4A, coordinate positions of pixels (unit blocks G) in X -axis direction are represented as 151 to 157. (column 7, lines 25-31)

Alternatively, as shown in FIG. 4B, by adding the luminances of unit blocks G arranged in a row extending in parallel with the direction in which the boundary line of the slider edge portion X_0 , it is possible to specify the luminance peak position. In FIG. 4B, the luminances of unit blocks arranged in Y direction at the X coordinate position "157" are digitized and then added together. (column 7, lines 59-65)

In each of the rows corresponding to X coordinate positions "151," "152," . . . of the unit blocks arranged in Y direction, that is, in each of the row with peak values positioned therein on the image and the rows adjacent thereto, the luminances of unit blocks are added.

FIG. 4C represents added luminance values graphically with respect to each of the rows arranged in Y direction. In each of the rows of X coordinate positions "151," "152," "153," luminance values are added and then compared for each row. In the same figure, if a curved line connecting the added values is drawn, a peak position (a predicted peak position) of that curved line can be specified to be the position of the boundary line of the slider edge portion X0.

Alternatively, there may be adopted a method wherein, in each of the rows extending in Y direction, a mean luminance value in unit blocks pixels) is determined to draw the curved line shown in FIG. 4C, and a peak value of the curved line is specified to be the position of the edge portion X0. (column 8, lines 3-20).

Therefore, the Examiner asserts that the invention of Tsumura teaches many of the features of the claimed invention and while the invention of Tsumura does teach determining defects caused by changes in observed luminance/intensity reflectance in a surface image (column 7, line 55 to column 8, line 13 and column 10, lines 1-12), Tsumura does not include the specifics on how the image discriminator determines locations of the defects.

The Examiner then asserts that Ozawa is the relied upon to teach such specifics of how the image discrimination. First, as noted in column 7, lines 25-31 and 59-63 and Figure 4A, Ozawa explicitly defines a digital image into m in the X-direction and n in the Y direction in a predetermined analysis region. Then, as noted in column 8, lines 16-20, Ozawa explicitly tests the image by calculating an average of luminance of the m basic units altogether aligned in the X directions per each of the n rows aligned in the Y direction and uses this average of luminance to obtain an

approximate line of a relation of the average of the luminance to a corresponding alignment in the Y direction as shown by curved line in Figure 4C. Ozawa then tests the device surface to discriminate a particular location with a fluctuation obtained from the approximate line, and the average value, specifically by determined where an average value causes the approximate line to fluctuate to a peak (column 8, lines 3-20 and Figure 4C).

The Examiner also asserts that it would have been obvious to one having ordinary skill in the art to modify the invention of Tsumura to include the specifics on how the image discriminator determines locations of the defects, as taught by Ozawa, because Ozawa suggests a corresponding method for determining borders caused by variations in brightness (column 5, lines 12-17), as applicable to the defect detection invention of Tsumura, that would have improved the accuracy of the defect detection by employing a method that is not limited by the arrangement of the photodetectors of the detection apparatus (column 2, lines 55-61).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

U.S. Patent No. 5,835,614 to Aoyama et al. teaches an image processing apparatus.

U.S. Patent No. 5,091,963 to Litt et al. teaches a method and apparatus for inspecting surfaces for contrast variations.

U.S. Patent No. 6,836,532 to Durst et al. teaches a diffraction system for biological crystal screening.

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey R. West whose telephone number is (571)272-2226. The examiner can normally be reached on Monday through Friday, 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (571)272-2216. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Jeffrey R. West
Examiner – AU 2857

December 11, 2006